RESEARCH NOTE LS-32

LAKE STATES FOREST EXPERIMENT STATION • U.S. DEPARTMENT OF AGRICULTURE

Artificially Constructed Mounds Show Promise in Yellow Birch Regeneration

Previous attempts to increase the proportion of yellow birch in hardwood stands at the Upper Peninsula Experimental Forest in Michigan by exposing mineral soil have shown that while birch established itself well on scarified areas, growth was poor.[1] Subsequent observations of birch seedling growth indicated that growth was better on naturally occurring mounds than on adjacent hollows and flats.

Mounds (or hummocks) are apparently formed by the action of windthrown trees. Soil of mounds is usually deep, friable, and better drained than that of the surrounding area. McLintock,[2] studying soil moisture patterns in a coniferous forest, speculated that hummocks might prove to be more productive since they dropped below saturation more rapidly in spring and were only a little drier during dry periods.

Accordingly, a test was made of birch seedling growth on artificial mounds in a hardwood-hemlock stand cut to an average of 70 square feet of basal area per acre.[3]

Three sites were tested — mounds, the exposed mineral soil between mounds, and adjacent undisturbed humus.

Twelve mounds were constructed by a small bulldozer. The top 3 to 6 inches of soil was scraped up and pushed into a mound which averaged 2 to 3 feet high and 5 feet long, and was roughly triangular in shape. The resulting mounds were a mixture of leaves, humus, mineral soil, and other forest debris (fig. 1,A).

Soil exposed between mounds was generally the grey, leached A_2 which is usually deficient in nutrients and is compacted. Trials with a penetrometer indicated that these intervening spaces averaged about five times as compact as the mounds (fig. 1, B).

In adjacent unscarified areas, advance reproduction and the litter were removed from quarter milacre spots (fig. 1, C).

Quarter milacre plots were established on each site and seeded heavily with yellow birch and sugar maple. After 1 year's growth, the tallest trees were tagged and measured on each plot. Twenty-five birch were tagged for each condition. Because of the unequal distribution of maple, 19 were chosen on mounds, 11 between mounds, and 26 on humus plots.

First-year measurements did not reveal any great differences in the growth of the selected trees. During the second year, yellow birch growth was greatest on mounds, least on humus, and intermediate on the mineral soil between mounds (differences are significant at the 1-percent level). Sugar maple appeared to be unaffected by differences in site. Yellow birch growth was superior to that of sugar maple on all sites. The total height at the end of the second year was about equal on humus plots for both species, but birch exceeded maple on the other sites as shown below.

	Total height (feet)		*Second-year growth (feet)*
	1961	*1962*	
On mounds			
Yellow birch	0.20	0.78	0.58
Sugar maple	.18	.33	.15
Between mounds			
Yellow birch	.12	.48	.36
Sugar maple	.16	.32	.16
Humus			
Yellow birch	.11	.39	.28
Sugar maple	.20	.31	.11

The better growth of seedlings on mounds may be due to less compaction, better drainage, and increases in fertility. (Tests of available nutrients with an agricultural kit indicate that some elements

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[1] *Godman, Richard M., and Laurits W. Krefting. Factors important to yellow birch establishment in Upper Michigan. Ecology 41: 18-28, illus. 1960.*

[2] *McLintock, T. Soil moisture patterns in a northern coniferous forest. U.S. Forest Serv., Northeast. Forest Expt. Sta., Sta. Paper 128, 5 pp., illus. 1959.*

[3] *Residual stand 10 inches d.b.h. and up.*

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FIGURE 1. — (A) Mounds constructed by a small bulldozer; (B) exposed mineral soil on area scraped up to collect material for mounds; (C) humus plots in adjacent unscarified areas.

may be in better supply on the mounds, a reasonable assumption since the more fertile humus is mixed in with the mineral soil.) Also, Jarvis[4] has reported that yellow birch grew better on mixed humus and mineral soil than on compacted mineral soil in Quebec.

Equally important is the ability of yellow birch to outgrow sugar maple of the same age on this shaded site. Probably height growth could be speeded up by opening the stand more since other studies show that birch seedling height growth increases as shade decreases from a closed canopy to clear cut.[4 5]

[4] *Jarvis, J. Cutting and seedbed preparation to regenerate yellow birch, Haliburton County, Ontario. Canad. Dept. of Northern Affairs and Nat. Resources, Forest Res. Div. Tech. Note 53, 17 pp., illus. 1957.*

[5] *Linteau, A. Factors affecting germination and early survival of yellow birch in Quebec. Forestry Chron. 24: 27-86, illus. 1948.*

The effect of artificial mounds on birch germination and establishment should be similar to that of some other scarification methods, and in addition may result in better height growth than has previously been reported for this area.[6]

In conclusion, artificial mounding may have merit for reproducing birch in selectively cut stands. Construction of mounds is simple, quick, and could be accomplished a little at a time at each harvest cut. However, variations will doubtless occur in different environments. Tests will be devised to find the management situations where artificial mounding could be recommended.

[6] *See footnote 1.*

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